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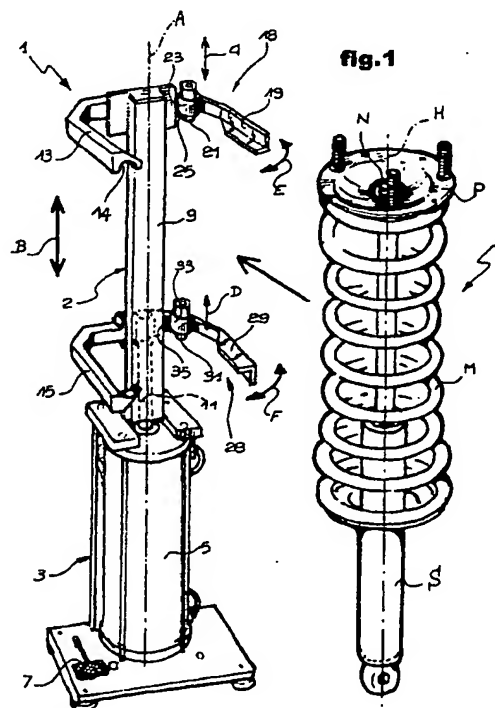
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Remarks:

A request for correction of the description and drawings has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) Apparatus for assembling and dismantling spring/shock absorber units for vehicle suspensions

(57) Apparatus for assembly and dismantling spring/shock absorber units for vehicle suspensions includes an elongate structure comprising a slidable stem (11) of an actuator device (5) and two abutment members (13, 15) intended to engage respective portions of a spring (M) of a spring/shock absorber (G) one of which (15) is connected to the stem (11). A pair of engagement elements (18, 28) disposed on the opposite sides from the abutment members (13, 15) with respect to the unit (G) are able to engage opposite portions of the spring (M), one of such elements (28) being connected to the stem (11). The engagement elements (18, 28) are movable transversely of the general axis (A) so that they can be introduced between a pair of turns of the spring (M). The spring/shock absorber unit can be engaged by the apparatus (1) with its axis (H) spaced from the general axis (A) and with the shock absorber (S) alongside the actuator (5) so that there is a completely free manoeuvring space at the end of the spring/shock absorber unit (G) opposite the actuator (5).



Description

[0001] The present invention relates to apparatus for assembly and dismantling of spring/shock absorber units for vehicle suspensions, in which a shock absorber is disposed coaxially within a coil spring interposed with a preload between two plates fixed respectively to two parts of the shock absorber mounted so as to be relatively slidable.

[0002] More specifically, the invention relates to apparatus for assembly and dismantling of spring/shock absorber units for vehicle suspensions, including:

- an elongate structure associated with an actuator device which includes a stem slidably mounted along a general axis of the structure,
- an abutment member stationary with respect to the structure and a thrust abutment member, counterposed with respect to one another, intended to engage portions of a spring of a spring/shock absorber unit respectively adjacent first and second ends of the spring, the thrust abutment member being connected to the said stem in such a way as to be axially slidable with it with respect to the stationary abutment member,
- first and second engagement elements adapted to engage portions of the spring respectively adjacent its first and second end, both disposed opposite an associated abutment member with respect to a plane passing through the axis of the spring/shock absorber unit, the second engagement element being connected to the said stem in such a way as to be slidable with it with respect to the structure substantially together with the thrust abutment member, both the engagement elements being movable transversely of the general axis of the structure in such a way that each of them can be introduced between a pair of turns of the said spring when it is engaged by both the engagement members.

[0003] Apparatus of the type indicated above is described in Italian Patent Application No. TO96A000229. This known apparatus comprises a horizontal frame the structure of which includes three parallel crosspieces on two of which are mounted respective pairs of slidable abutment members, a pair of engagement elements being mounted on the remaining cross piece. The position of two abutment members and one engagement element is adjustable in such a way as to permit fixing to the frame in a position in which they constitute a stationary support for a portion of one turn of the spring of a spring/shock absorber unit, adjacent the first end of the spring. The other two abutment members and the remaining engagement element, each of which is positioned axially opposite a respective one of the abutment members and the engagement element mentioned above, are connected to a carriage

movable along the frame in such a way as to constitute a slidable thrust unit engageable with a turn of the spring adjacent its second end. The movement of the thrust unit is controlled by means of a pneumatic actuator which projects from one side of the frame.

[0004] To dismantle a spring/shock absorber unit this is disposed on the frame with its axis substantially coincident with that of the structure of the frame, and with the shock absorber facing the part opposite the actuator. In fact, the shock absorber cannot be positioned on the other part of the actuator since in this case it would interfere with the stem and with elements connected to it. In particular, a portion of the spring adjacent its end opposite the shock absorber is engaged by the abutment members and by the engagement element fixable to the frame after their position has been adjusted in a manner corresponding to the shape of this end of the spring, after which the actuator device is actuated to bring a pair of abutment members of the thrust unit to take up position against a portion of the spring adjacent its other end. In this configuration the remaining engagement member is moved such that it can be introduced between two turns of the spring by the actuator. Then the actuator is actuated again in such a way as to cause a further displacement of the thrust unit to compress the spring until at least counteracting its pre-compression so as to make it possible to dismount the spring support plates disposed at the ends of the spring/shock absorber unit opposite the body of the shock absorber.

[0005] Because of the structure of the frame of this known apparatus the manoeuvring space available for movement of the apparatus used to remove the plate fixing member from the shock absorber, typically a clamping nut, is rather restricted, which complicates the operation of dismantling the shock absorber. In particular this space is not sufficiently wide to allow the use of the normal automatic unscrewing devices used in garages.

[0006] For the purpose of overcoming this disadvantage the subject of the invention is an apparatus of the above-mentioned type disposed with its axis significantly spaced from the general axis of the structure in such a way that the shock absorber lies substantially alongside the actuator device so that there is a completely free manoeuvring space at the end of the spring/shock absorber unit opposite the actuator device.

[0007] Thanks to this arrangement the spring/shock absorber device can be disposed with the shock absorber alongside the actuator device in such a way that at the end of the apparatus opposite the actuator device there are no elements able to obstruct the operations needed for coupling and uncoupling the shock absorber and the spring of the unit.

[0008] According to a preferred characteristic of the invention the apparatus includes a support base to which the body of the actuator device is coupled and from which, in use of the apparatus, the said structure

extends upwardly so that the said manoeuvring space is above the apparatus.

[0009] In this way the apparatus extends vertically so that it can be located in a narrow space and nevertheless allows work on a spring/shock absorber unit to be performed conveniently from above, with all the advantages of rapid execution of the dismantling and assembly operations.

[0010] Further characteristics and advantages of the invention will become more clearly evident from the following detailed description, provided purely by way of non-limitative example and with reference to the attached drawings in which:

Figure 1 is a schematic perspective view of an apparatus according to the present invention;

Figure 2 is an enlarged front elevation view of a detail indicated by the arrow II in Figure 1 in a first operating condition of the apparatus; and

Figure 3 is a view similar to Figure 2 in another operating condition of the apparatus.

[0011] With reference to the drawings, an apparatus for dismantling and assembling spring/shock absorber units G for vehicle suspensions is generally indicated 1. The apparatus 1 comprises an elongate structure 2 having general axis A and including a support base 3 by which it rests on the ground, with which the body of an actuator cylinder 5, normally of the pneumatic type, is associated, for example operable by an operator by means of a pedal 7.

[0012] The structure 2 includes in particular a column 9 of hollow profile which extends from the base 3 and within which is fitted a stem 11 of the cylinder 5 in such a way as to be axially slidable along the axis A along the direction indicated by the arrow B of Figure 1.

[0013] At the end of the column 9 opposite the cylinder 5 is fixed a stationary abutment member 13 having the form of a substantially arcuate arm the free end of which has a hollow seat 14 facing towards the cylinder 5, having a shape such as to allow engagement of a portion of one turn of the spring M of the spring/shock absorber unit G. In particular, the seat 14 is intended to be engaged by a portion of a turn of the spring M adjacent its end opposite the shock absorber S of the unit G, or rather by a part of a plate P for retaining the spring M fixed by means of a nut N to the stem of the shock absorber S.

[0014] From the free end of the stem 11 extends another arm 15 similar to the arm 13 and serving as a thrust abutment member, at the free end of which is formed a hollow seat 16 opposite the seat 14, also engageable with a portion of a turn of the spring M adjacent its end nearest the shock absorber S.

[0015] Both the seats 14 and 16 are spaced from the axis A and disposed in such a way as to be able to hold the spring M of the unit G when this latter is disposed with its axis H substantially spaced from and par-

allel to the axis A so that the unit G can be held by the apparatus 1 with the spring M engaged in the seats 14 and 16, the shock absorber S being disposed substantially along side the cylinder 5.

[0016] To the column 9, opposite the arm 13, there is moreover fixed a first engagement element 18 which comprises an arm 19 mounted in such a way as to be swingable transversely with respect to the axis A in the direction indicated by the arrow E. At one end of the arm 19 there is fixed perpendicularly a pin 21 which in turn rotatably engages a bush 23 supported by a bracket 25 rigidly connected to the column 9.

[0017] A second engagement element 28 is fixed to the free end of the stem 11 in a position opposite the engagement element 18 on the opposite side the column 9 from the arm 15. The element 28 comprises an arm 29 also swingable transversely with respect to the axis A in the direction identified by the arrow F, and one end of which is connected rigidly to a perpendicular pin 31 which rotatably engages a portion 33 supported by a bracket 35 fixed to the stem 11. Both the shafts 21 and 31 are moreover mounted so as to be axially slidable in the associated bushes 23 and 33 along the directions respectively identified by the arrows of C and D.

[0018] When the spring M of the unit G is held by means of the abutment members 13 and 15, the elements 18 and 28 can be displaced manually from a position outside the spring M to a position in which each is introduced between two turns of the spring M, respectively at the part of the spring M adjacent its opposite ends, starting from the condition illustrated in Figure 2 to reach the condition of Figure 3.

[0019] In operation of the apparatus 1 the unit G is disposed at the structure 2 with the shock absorbers S alongside the actuator 5 to allow it to be dismantled or to allow the shock absorber S to be separated from the spring M, for example to allow for replacement of the shock absorber itself. When a turn at the end of the spring M opposite the shock absorber S is disposed in correspondence with the seat 14 the actuator cylinder 5 is actuated to bring the seat 16 into engagement with a portion of a turn of the spring M at the end of the shock absorber S. In this configuration, in which the unit G is stably connected to the apparatus 1 and the spring M is still in the assembled extended configuration, it is possible to introduce the arms 19 and 29 between pairs of turns of the spring M respectively adjacent its opposite ends by manually displacing the arms 19 and 29 in the directions defined by the arrows C, E and D, F.

[0020] At this point the actuator 5 can again be actuated to apply to the spring M, which is now symmetrically loaded with respect to the axis H of the unit G, an increasing load to compress it whereby to counteract its assembly preload.

[0021] Having reached this condition the nut N which connects the shock absorber S to the plate P of the unit G disposed in the upper part of the apparatus 1 can be removed. The operation of unscrewing the nut N

can be performed conveniently by operating in the free manoeuvring space present above the apparatus 1 which, in particular, makes it possible easily to utilise automatic unscrewing devices commonly utilised in garages.

[0022] The shock absorber S can be replaced with another and it is then possible to proceed to assembly of the spring/shock absorber unit G by repeating the above-described operations in the reverse sense.

[0023] Thanks to the structure of the apparatus 1 which has a vertical rather than a horizontal extent, it can be positioned in such a way as to occupy little space.

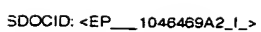
Claims

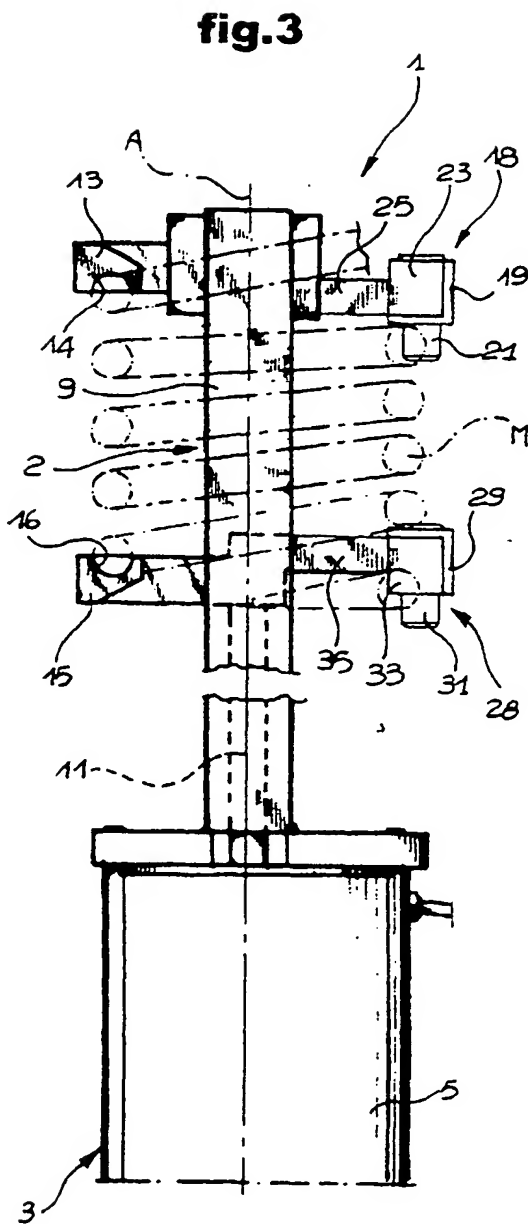
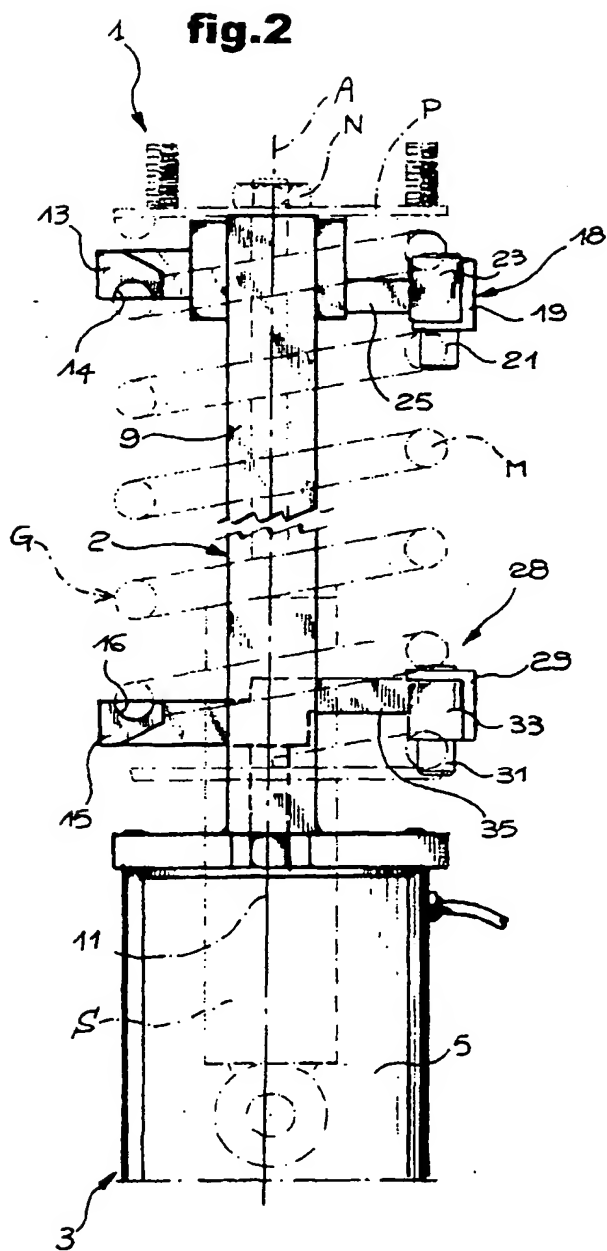
1. Apparatus for assembling and dismantling spring/shock absorber units for vehicle suspensions, including:

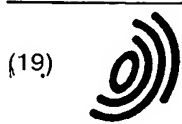
- an elongate structure (2) associated with an actuator device (5) which includes a stem (11) slidably mounted along a general axis (A) of the structure (2),
- an abutment member (13) stationary with respect to the structure (2) and a thrust abutment member (15) counterposed with respect to one another, intended to engage portions of a spring (M) of a spring/shock absorber unit (G) respectively adjacent first and second ends of the spring (M), the thrust abutment member (15) being connected to the said stem (11) in such a way as to be axially slidable with it with respect to the stationary abutment member (13),
- first and second engagement elements (18, 28) adapted to engage portions of the spring (M) respectively adjacent its first and second end, both disposed opposite an associated engagement member (13, 15) with respect to plane passing through the axis (H) of the spring/shock absorber unit (G), the second engagement element (28) being connected to the said stem (11) in such a way so as to be slidable with it with respect to the structure (2) substantially together with the thrust abutment member (15), both the engagement elements (18, 28) being movable transversely of the general axis (A) of the structure (2) in such a way that each of them can be introduced between a pair of turns of the said spring (M) when it is engaged by both the abutment members (13, 15), characterised in that the engagement elements (18, 28) and the abutment members (13, 15) are arranged to engage the spring/shock absorber unit (G) disposed with its axis (H) significantly spaced from the general axis (A) of

the structure (2) in such a way that the shock absorber (S) lies substantially alongside the actuator device (5) such that there is a completely free manoeuvring space at the part of the spring/shock absorber unit (G) opposite the actuator device (5).

2. Apparatus according to Claim 1, characterised in that it includes a support base (3) to which the body of the actuator device (5) is coupled and from which, in use of the apparatus (1) the said structure (2) extends upwardly so that the said manoeuvring space is above the apparatus (1).
3. Apparatus according to Claim 2, characterised in that the structure (2) includes a single hollow column (9) which extends upwardly from the support base (3) and serves as a guide element for the sliding of the stem (11) of the actuator device (5).
4. Apparatus according to any of Claims 1 to 3, characterised in that each movable engagement element (18, 28) comprises an arm (19, 29) pivotally in a plane transverse the general axis (A) of the structure (2) so that it can be displaced, when the spring (M) is engaged only by the said abutment members (13, 15), between a position spaced from the spring (M) and a position interposed between two successive turns of the spring (M).
5. Apparatus according to Claim 4, characterised in that each pivotal arm (19, 29) is associated with a shaft (21, 31) which defines a pivot axis perpendicular to the associated arm (19, 29), this shaft (21, 31) pivotally engaging a bush (23, 33) anchored to a bracket element (25, 35) fixed to the associated abutment member (13, 15).
6. Apparatus according to Claim 5, characterised in that each of the said shafts (21, 31) is axially slidably mounted with respect to the associated bush (23, 33).
7. Apparatus according to Claim 5 or Claim 6, characterised in that the abutment members (13, 15) are both disposed substantially on the same side of an axial plane defined by the axis (H) of the spring (M) and the general axis (A) of the structure (2), both said pivotal arms (19, 29) being disposed on the opposite side of the said plane.
8. Apparatus according to any of Claims from 1 to 7, characterised in that the actuator device includes a pneumatic cylinder (5).







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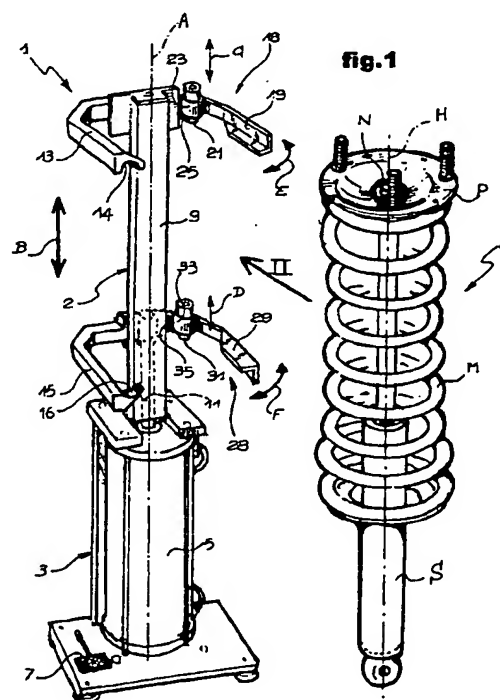
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(54) Apparatus for assembling and dismantling spring/shock absorber units for vehicle suspensions

(57) Apparatus for assembly and dismantling spring/shock absorber units for vehicle suspensions includes an elongate structure comprising a slidable stem (11) of an actuator device (5) and two abutment members (13, 15) intended to engage respective portions of a spring (M) of a spring/shock absorber (G) one of which (15) is connected to the stem (11). A pair of engagement elements (18, 28) disposed on the opposite sides from the abutment members (13, 15) with respect to the unit (G) are able to engage opposite portions of the spring (M), one of such elements (28) being connected to the stem (11). The engagement elements (18, 28) are movable transversely of the general axis (A) so that they can be introduced between a pair of turns of the spring (M). The spring/shock absorber unit can be engaged by the apparatus (1) with its axis (H) spaced from the general axis (A) and with the shock absorber (S) alongside the actuator (5) so that there is a completely free manoeuvring space at the end of the spring/shock absorber unit (G) opposite the actuator (5).





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EUROPEAN SEARCH REPORT

Application Number
EP 00 10 8416

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y	* column 7, line 20 - line 23; figures * * abstract *	4,5,7,8	
Y	DE 28 53 090 A (KLANN HORST) 12 June 1980 (1980-06-12) * claim 11; figures 4,7 *	8	
Y	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 09, 30 September 1997 (1997-09-30) & JP 09 136270 A (KAYABA IND CO LTD), 27 May 1997 (1997-05-27) * abstract; figures 1,5 *	4,5,7	
A	US 5 172 462 A (HA TAE-HONG) 22 December 1992 (1992-12-22) * figures 1,6 *	1,4-6	
A	EP 0 629 474 A (WEITNER WERNER) 21 December 1994 (1994-12-21) * abstract; figures *	1,4,5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B25B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 January 2001	Examiner Majerus, H
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 10 8416

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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22-01-2001

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